



Risk-Based Decision-Making Performance Assessment Study Bulletin #1

Study Background, Potential Performance Measures, and Preliminary Findings

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This bulletin describes the Risk-Based Decision-Making (RBDM) Performance Assessment Study, provides an overview of potential performance criteria that may be useful for states evaluating RBDM-based Leaking Underground Storage Tank programs, and details preliminary study findings.

The Risk-Based Decision-Making (RBDM) Performance Assessment Study is an ongoing research effort designed to assist state and territorial environmental regulatory agencies with the evaluation of their individual RBDM corrective action program performance for Leaking Underground Storage Tanks (LUST). This evaluation will help to determine whether RBDM programs are achieving their state agency management goals.

The study will review five individual state programs which have augmented their existing programs with RBDM and evaluate the impact of RBDM on overall program performance. This series of bulletins will report on the progress of the study and summarize the successes and challenges identified, which may assist other states that are implementing or considering RBDM programs. The study will not compare performance between states.

The study is being conducted by the American Society for Testing and Materials (ASTM), funded under an assistance agreement with the U.S. Environmental Protection Agency (EPA), and performed by Groundwater Services, Inc. (GSI).

Risk-Based Decision-Making

EPA's Office of Solid Waste and Emergency Response (OSWER) Directive 9610.17 encourages state UST programs to apply RBDM to the corrective action process at petroleum

release sites. RBDM is a flexible decision management framework that can be customized to fit the needs of individual agency programs. When RBDM is incorporated into the LUST corrective action process, the result is usually referred to as Risk-Based Corrective Action (RBCA). The ASTM RBCA Standard E-1739-95 is one example of a RBDM framework that has been used by states to design or augment their corrective action programs. RBCA generally employs a tiered approach to site assessment to better match the remediation effort to the relative complexity of each site. The tiered approach utilizes three principal activities:

- Determine site-specific standards based on the potential for impacts to human health or the environment.
- Prioritize sites based on the timing or magnitude of potential impacts.
- Select remediation alternatives based on exposure control and technical feasibility.

To date, 18 state environmental regulatory agencies have augmented their existing LUST programs with RBDM. Additionally, 23 states and territories are evaluating the approach. Some state agencies are using RBDM approaches to manage the remediation at other types of contaminated sites. Visit the EPA Office of Underground Storage Tank (OUST) website for up-to-date statistics on state RBDM status:

www.epa.gov/swrust1/rbdm

RBDM PERFORMANCE ASSESSMENT STUDY:

Phase 1 - Develop Performance Measures

Phase 2 - Collect and Evaluate Pilot State Data

Phase 3 - Issue General and State-Specific Recommendations

Study Background

The RBDM Performance Assessment Study will develop tools that can be used by states and territories to assess the performance of their RBDM programs. These tools will be used to evaluate the programs in five pilot states. The study will be undertaken in three consecutive phases:

- (1) Develop performance measures
- (2) Collect and evaluate pilot state data
- (3) Issue general and state-specific recommendations.

The first study phase focuses on developing quantitative performance criteria to evaluate program performance. These general “performance measures” are intended to track progress towards program goals based on annual record surveys conducted by the state agencies. The list will be based on an evaluation of existing programs and their management goals, and will identify the data required for performance evaluation.

Following the development of potential performance measures, individual pilot state data will be collected and a preliminary assessment conducted to evaluate pilot state progress to date. To limit the workload on the pilot states, the assessments will focus on readily available site information, generally the data tracked in an electronic database. The specific performance measures evaluated for each pilot state will likely differ due to the unique characteristics of each corrective action program.

An analysis will then be prepared for each pilot state detailing the progress in achieving its individual program goals and historical performance. If the initial analysis proves to be inconclusive at this time, the study will recommend following state performance prospectively until a useful conclusion can be drawn. In addition to providing individual recommendations to the five pilot states, the final phase of the study will analyze the collective study results and will make general and state-specific recommendations on RBDM performance, assessment measures, and program evaluation management that may be of value to other state programs.

Pilot States

Five state environmental regulatory agencies are participating in this study:

- Illinois Environmental Protection Agency
- Iowa Department of Natural Resources
- North Carolina Department of Environment and Natural Resources
- Texas Natural Resource Conservation Commission
- Utah Department of Environmental Quality.

The selected pilot states have implemented RBDM programs and have expressed interest in evaluating their program performance. No more than one state per EPA Region was selected.

The role of the pilot states is to provide constructive input on the goals of their individual programs, the performance measures currently utilized in their state, the types of site information that can be tracked without undue burden, and the utility and feasibility of the draft performance criteria developed in the first phase. In addition, the pilot states will provide their program data for use in the preliminary RBDM performance assessment.

Potential Performance Measures

Potential performance measures were developed by ASTM, EPA, and GSI utilizing the following process:

- (1) Identify common RBDM program goals
- (2) Devise a matrix of potential measures for each goal
- (3) Work with pilot states to address the general utility and feasibility of the potential measures.

The measures will help communicate to stakeholders such as state citizens, responsible parties, and legislators the progress in achieving program goals.

Common RBDM Goals

The overall goal of state LUST programs is to protect human health and the environment. To achieve this end, the commonly cited management goals for RBDM program implementation are to reduce risk, to expedite remediation / closure of impacted sites, and to improve cost control and resource allocation.

Performance Measures

The study identified ten performance measures as pertinent and feasible for evaluating the common RBDM goals identified above. The suggested performance measures, listed in Table 1 (see page 4), represent a “gold standard” of generic measures. Each regulatory authority will select the most appropriate measures for a specific state program. The performance measures have been grouped into three

COMMON RBDM PROGRAM GOALS:

Protect human health and the environment by:

- Reducing risk
- Expediting closure of impacted sites
- Improving cost control and resource allocation

categories which correspond to the common RBDM program goals: risk reduction, expedited site remediation / closure, and cost control / resource allocation. The risk reduction measures each target a different measure of site risk: risk classification, constituent concentration, and site cleanup. The remediation / closure measures track the progress of sites through the remediation process (e.g., evaluation, corrective action plan approval, and site closure) and also measure total case backlog. Finally, the cost control measures track remediation costs and program administrative costs.

Some of the performance measures may require new types of data tracking and interpretation. For example, as illustrated in Figure 1 (see below), risk reduction in a population of sites can be tracked on the basis of the *Site Classification Profile* of the active LUST population within a state database. Individual sites are classified based on risk of human health or environmental impacts using the ASTM classification system (ASTM 1995) or an alternative system. Either the movement of individual sites from high risk categories to low risk categories or

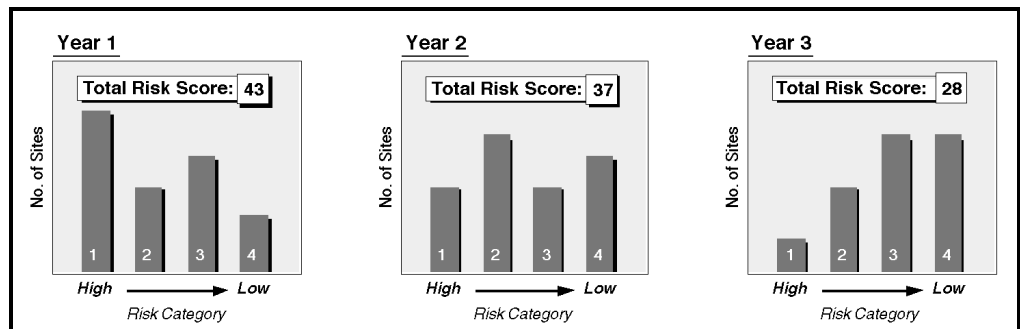


FIGURE 1: USE OF SITE CLASSIFICATION PROFILE TO TRACK RISK REDUCTION

TABLE 1: LIST OF SUGGESTED PERFORMANCE MEASURES FOR EVALUATION OF LUST RBDM PROGRAMS

PROGRAM GOAL	PERFORMANCE MEASURE	TRACKING DESCRIPTION	SITE DATA REQUIRED
Risk Reduction	Composite Site Classification Profile (see Figure 1)	Distribution of site classifications or sum of individual site classification scores	Site classification, Site score (i.e., high score for high risk)
	Composite Constituent Reduction Factor (CRF) Profile	Distribution or sum of CRFs (CRF is max site concentration / site cleanup goal)	Maximum site constituent concentration, Site cleanup concentration goal
	Cleanups Completed	Number of corrective actions resulting in site closure	Remedy implemented, Closure date
Expedited Site Remediation / Closure	Case Backlog	Number of sites currently managed by the state program	Incident reporting date, Closure date
	No Action Sites	Percentage and overall number of sites not requiring corrective action following risk-based site evaluation	Closure date, Remedy implemented
	Action Plans Not Requiring Agency Approval	Percentage and overall number of new sites not requiring agency approval of action plan (e.g., RAP or CAP)	Action Plan need determination, Determination date
	Time to Action Plan Approval	Time from incident reporting to state approval of a corrective action plan	Incident reporting date, Action Plan approval date
	Time to Closure	Time from incident reporting to site closure	Incident reporting date, Closure date
Cost Control / Resource Allocation	Administrative Oversight	Resource allocation for program management per case closure, per active site, and for overall program	Agency labor costs, Agency head count, Case backlog, Total site closures
	Remediation Cost	Total expense from incident reporting to site closure for the responsible party or for the state reimbursement fund	State fund reimbursed cost, Remediation cost (or remedy implemented and average remedy cost)

reduction of the total number of LUST sites can lower the “total risk score” from year to year (see Figure 1 above). Measurement of risk reduction requires tracking both historical and current risk classification for each site.

Another potentially useful measure is the *Constituent Reduction Factor* (CRF), the ratio of measured constituent concentrations to the risk-based cleanup standards for each site. CRF tracking can provide a quantitative measure of the potential risk posed by the site. Most states do not currently track the CRF, the maximum constituent concentrations, or the site clean-up goals in their electronic LUST databases. Addition of these parameters to the database is required to use CRF as a performance measure.

Uses of Performance Measures

The potential performance measures developed can serve to track performance of an individual RBDM program over time or to compare the performance of a RBDM program to a previous state LUST program. They are structured only to evaluate the performance of a single management program over time. Significant differences in program implementation make direct comparison of state programs difficult.

RBDM performance evaluation results can be used to ensure protection of human health and the environment and to maximize program efficiency within a program. A quantitative assessment of program performance will help communicate to stakeholders such as state citizens, responsible parties, and legislators the progress in achieving program goals.

PERFORMANCE MEASURE USES:

- Track Progress
- Improve Efficiency
- Inform Stakeholders

Preliminary Findings

Although this study is still underway, some preliminary findings can be drawn and are being presented to assist other states with implementation of their RBDM programs. Regulatory agencies planning the use of these performance measures should consider:

Database Design

Most of the data necessary for RBDM performance evaluation are presently collected by the pilot states, but some of the key factors are either not tracked electronically or are dispersed throughout many associated databases. Simple changes in how agencies process and store site information in their LUST databases may help them track the needed information. For example, after site characterization, many “soil only” sites can be closed with little or no remediation. However, many states do not track the degree of remediation required to achieve site closure. As a result, it is difficult to determine the impact of RBDM on sites which require more extensive remediation to achieve closure. State databases should include a field which describes the level of remediation required to achieve closure, such as the maximum constituent concentration or the CRF. In addition, a single “Closure Date” field will facilitate analysis of performance measures associated with site closure. Finally, tracking site classification changes for a particular site over time or, at a minimum, recording the initial and current site classification ratings will allow evaluation of risk reduction trends.

Confounding Factors

Some of the RBDM performance measures can be impacted by factors not directly related to the management goals. For instance, increased use of natural attenuation remedies will serve to reduce remediation costs, but, at the same time, may increase the average time to closure, resulting in an apparent decrease in closure-related performance

measures. Other potential confounding factors include regulatory deadlines (e.g., 1998 tank upgrade deadline), shortfalls in the state reimbursement fund, legislative action drivers, and staff-time allocation (i.e., regulatory man-hours). The effects of confounding factors must be carefully considered in the selection and interpretation of RBDM performance criteria. To minimize such effects, RBDM programs may wish to rely upon several performance measures to analyze program performance.

Early Indicators

Program performance evaluation using the proposed RBDM performance measures requires review of annual or semi-annual data. Consequently, several years may be required to observe significant trends. To quantify progress during the first years of RBDM implementation, “early indicators” may be more useful. For example, after RBDM implementation significant progress in expedited site remediation / closure may be seen in:

- An increase in the number of “No Action Sites”, newly reported sites which do not require an active remedy following completion of a risk-based site evaluation;
- An increased closure rate for “Historical Release Sites”, sites which have been in the state portfolio for several years without achieving closure; or
- A decrease in the case backlog.

Next Steps

This bulletin details the findings of the first phase of the RBDM Performance Assessment Study. Results from subsequent phases will be reported in future bulletins.

The second study phase, presently underway, focuses on a preliminary assessment of the individual RBDM programs of the five pilot states and attempts to evaluate the success of these

programs in achieving their management goals. The study will also attempt to compare the performance of the RBDM program to the previous regulatory program within each state.

The final study phase will draw general conclusions from the collective study results.

Additional Information

For more information on RBDM programs and their implementation, see the following sources:

Websites

OUST Risk-Based Decision Making:
www.epa.gov/swrust1/rbdlm

ASTM Standards:
www.astm.org

RBCA State Policy Issues Database:
www.gsi-net.com/RBCAPOL

Publications

- 1) American Society for Testing and Materials, 1995, “Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites,” ASTM E-1739-95, Philadelphia, PA.
- 2) American Society for Testing and Materials, 1998, “Standard Provisional Guide for Risk-Based Corrective Action,” ASTM PS 104-98, Philadelphia, PA.
- 3) Office of Solid Waste and Emergency Response (OSWER), 1996, “Use of Risk-Based Decision-Making in UST Corrective Action Programs,” OSWER Directive 9610.17, March 1, 1996.
- 4) GSI, 1995, “Tier 2 RBCA Guidance Manual for Risk-Based Corrective Action,” Houston, Texas, 713/522-6300.

